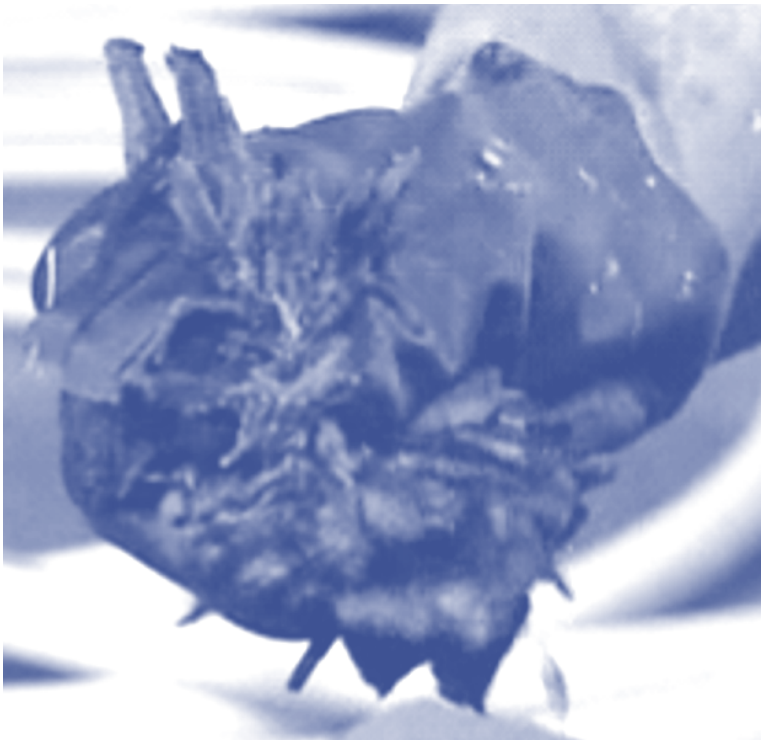
Industrial Technologies Program

Yield improvement and energy savings using phosphonates as additives in kraft pulping

Phosphonate additives in kraft pulping promise substantial energy savings, increased yield, and bleaching cost reduction

The kraft process, the predominant pulping technology for producing chemical pulps of high strength, is used to produce approximately 51 million metric tons of pulp per year in the United States. Recent changes introduced to the kraft process are directed toward yield improvement, energy savings, or reduced bleaching chemical additions which are all restrained by capital costs or limited effectiveness.

Preliminary results show that adding phosphonate to the kraft cooking liquor increases lignin removal, improves yield, bleached brightness, and conserves pulp viscosity. This new technology does not require the capital investment that has limited recent innovations. Development and optimization of phosphonate additives for the kraft process can increase pulp yields, reduce energy and chemical use, and reduce overall effluent discharge.



Wood chips after kraft cooking with phosphonate

Benefits

- *Up to 10% energy savings in the digestion process*
- *4-6% yield increases*
- *8-12% wood cost reduction*
- *Reduced chemical use*
- *Up to 20% AOX reduction*

Applications

Phosphonate additives can be added to the cooking liquor in the kraft pulping process to supplement lignin removal. Phosphonate would replace alternate pulping additives and may be added to all kraft mills.

Project Description

Goal: Develop and optimize a new technology using phosphonates as additives in kraft pulping.

The project objectives are as follows:

1. Develop a commercially viable modification to the kraft process resulting in significant energy savings, increased yield, and improved bleaching ability.
2. Evaluate the feasibility of the newly developed technology across a spectrum of wood species used in North America.
3. Determine the best phosphonate and optimum process conditions for each of the major wood species.
4. Develop a detailed, fundamental understanding of the mechanism by which phosphonates improve KAPPA number and yield.
5. Evaluate the impact of phosphonate additions in the overall chemical recovery cycle.
6. Demonstrate commercial application of the optimized technology by conducting extended mill trials.
7. Evaluate the North American market potential for the use of phosphonates in the kraft pulping process.
8. Identify factors influencing process adoption among North American kraft mills.
9. Examine determinants of customer-perceived value and explore organizational and operational factors influencing attitudes and behaviors.
10. Provide an economic feasibility assessment for the supply chain, both suppliers and buyers.
11. Provide background to most effectively transfer this new technology to commercial mills.

Progress and milestones

- 3 years of experiments using commercial aspen, pine, and mixed hardwood chips and 12 different phosphonates were performed at the University of Minnesota.
- Experiments demonstrate that addition of phosphonates to the kraft cooking liquor improves delignification, increases overall yield, and increases strength and brightness.

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Project Partners

University of Minnesota
St. Paul, MN

Solutia Inc.
Webster Grove, MI

For additional information, please contact:

Dickson Ozokwelu
Office of Industrial Technologies
Phone: (202) 586-8501
Fax: (202) 586-1658
E-mail: dickson.ozokwelu@ee.doe.gov

Dr. Ulrike Tschirner
Paper Science & Engineering
University of Minnesota
2004 Folwell Avenue
St. Paul, MN 55108
Phone: (612) 624-8798
Fax: (612) 625-6286
E-mail: Ulrike@umn.edu

Please send any comments, questions, or suggestions to webmaster.eren@nrel.gov

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